

Preparing personnel for safe and effective operation in harsh and volatile environments

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Recommended citation(APA):
Pope, R. R., Orr, R. M., Brearley, M., Gorey, R. J., & Irving, S. (2017). *Preparing personnel for safe and effective operation in harsh and volatile environments*. 2017 Australian and New Zealand Search and Rescue Conference, Gold Coast, Queensland, Australia.

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PREPARING PERSONNEL FOR SAFE AND EFFECTIVE OPERATION IN HARSH AND VOLATILE ENVIRONMENTS



Rod Pope
Scott Gayton
Shane Irving
Matt Brearley
Richard Gorey
Rob Orr





Overview

- Psychological preparation – *Scott Gayton*
- Injury risks & impacts – *Rod Pope*
- Security & protection of teams – *Shane Irving*
- Hot & humid conditions – *Matt Brearley*
- Preparing for field operations – *Richard Gorey*
- Load carriage – *Rob Orr*
- Wrap-Up & Panel Q & A – *Rod Pope*





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Psychological Preparation for SAR

Scotty Gayton (Major, PhD)

<https://bond.edu.au/tru>





Selection of MCT– A focus on the “soft skills”

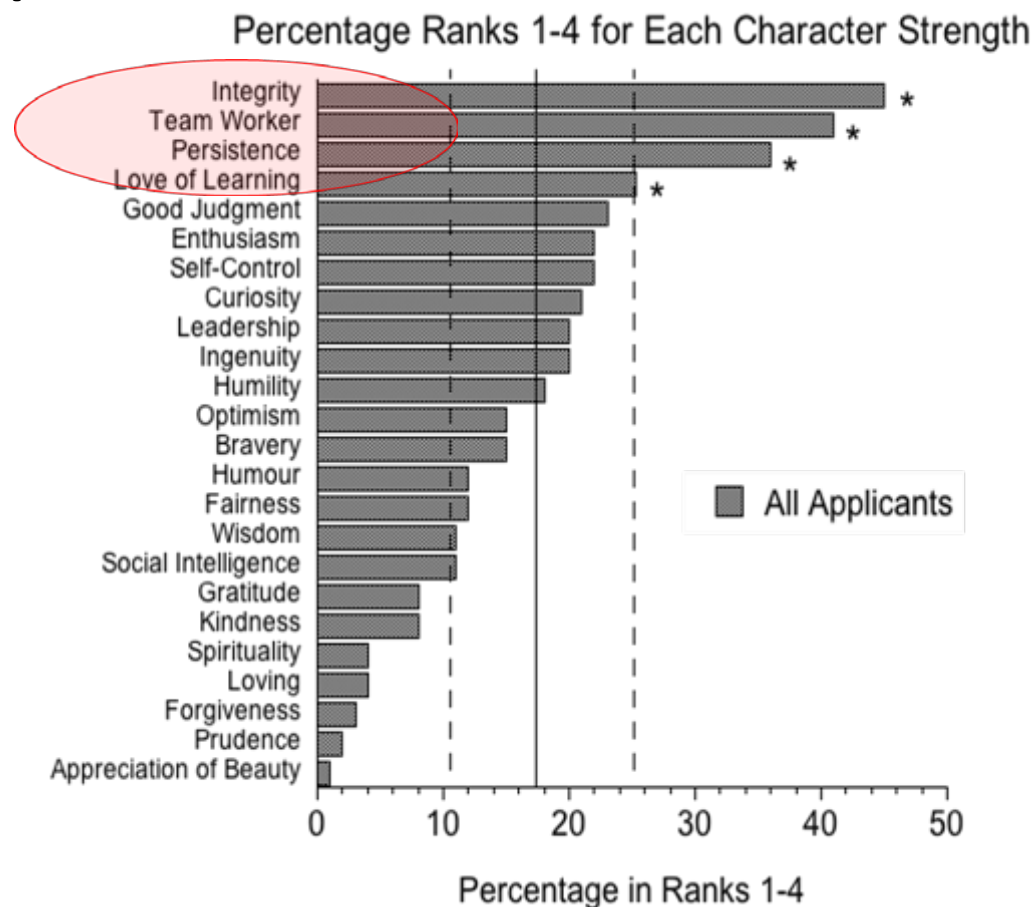


- Human factors and errors
- How do we select the right people?
- Selection program design
- Team behaviours must be assessed
- Peer rating
- Character versus competence
- Physical capability



Character versus competence (Gayton & Kehoe, 2015)

- Values drive behaviour!

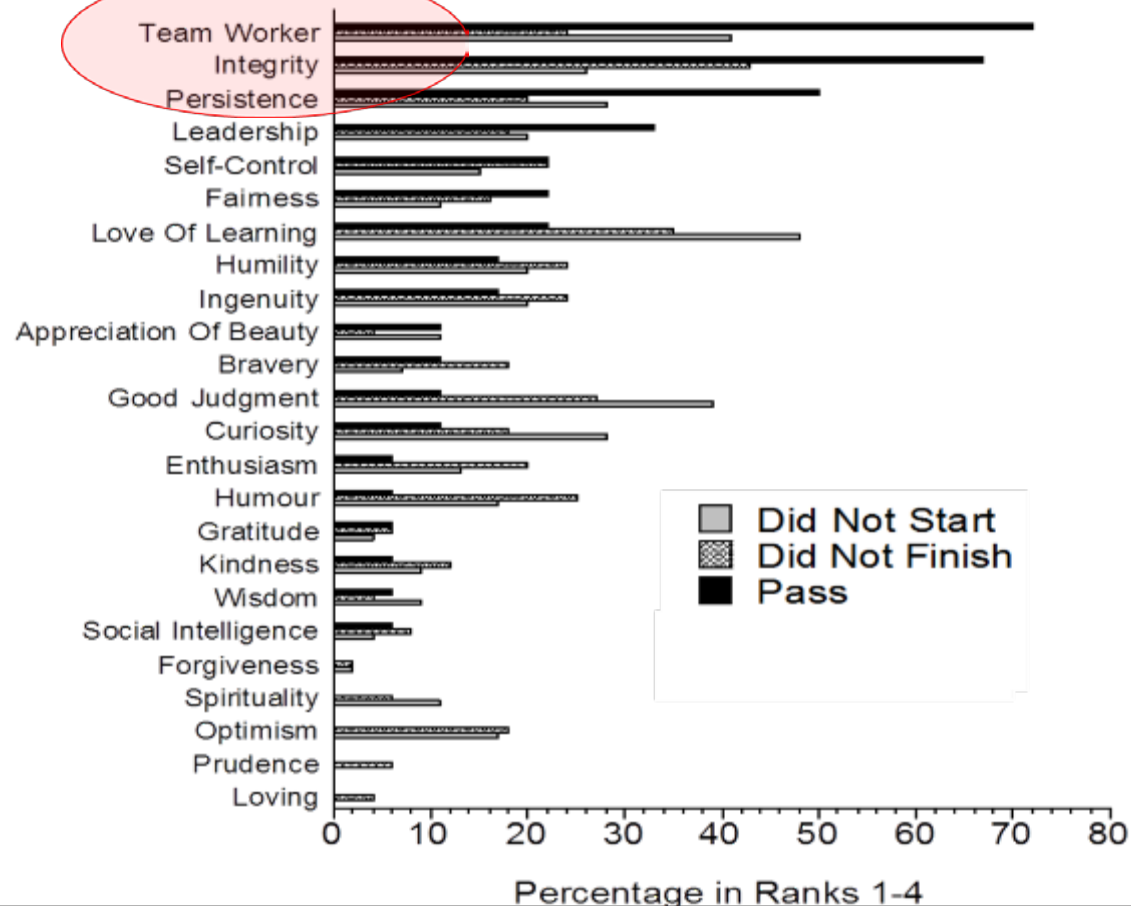




Character versus competence

Character Strengths and values

- Integrity
- Teamwork
- Persistence
- Trustworthiness
- Good judgement





Optimum team behaviours...

- Tolerate ambiguity: Interpret environmental cues and take action quickly
- Effective Communication: Information is interpreted correctly and communicated to team
- High levels of individual and team SA
- Well defined roles and team goals
- Are able to adjust team processes and strategies rapidly
- Shared consciousness
- Adaptive precision
- Shared trust and purpose





Developing trust in swift action starting teams



- **Competence:** expert knowledge, technical facility, and everyday routine performance (Stanton, 2011).
- **Benevolence:** Is the extent that a trustee is seen as wanting to do good to a trustor, independent of their self-interests – believing that others are well intentioned reduces risk and uncertainty.
- **Integrity:** Is regarded as a necessary ingredient in building trust within teams (Baker et al., 2006; Mayer, Davis, & Schoorman, 1995; Salas et al., 2008; Stanton, 2011, Gayton & Kehoe, 2015).



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Interoperability





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You do not rise to the
situation, you sink to the
level of training!



Training for the unknown

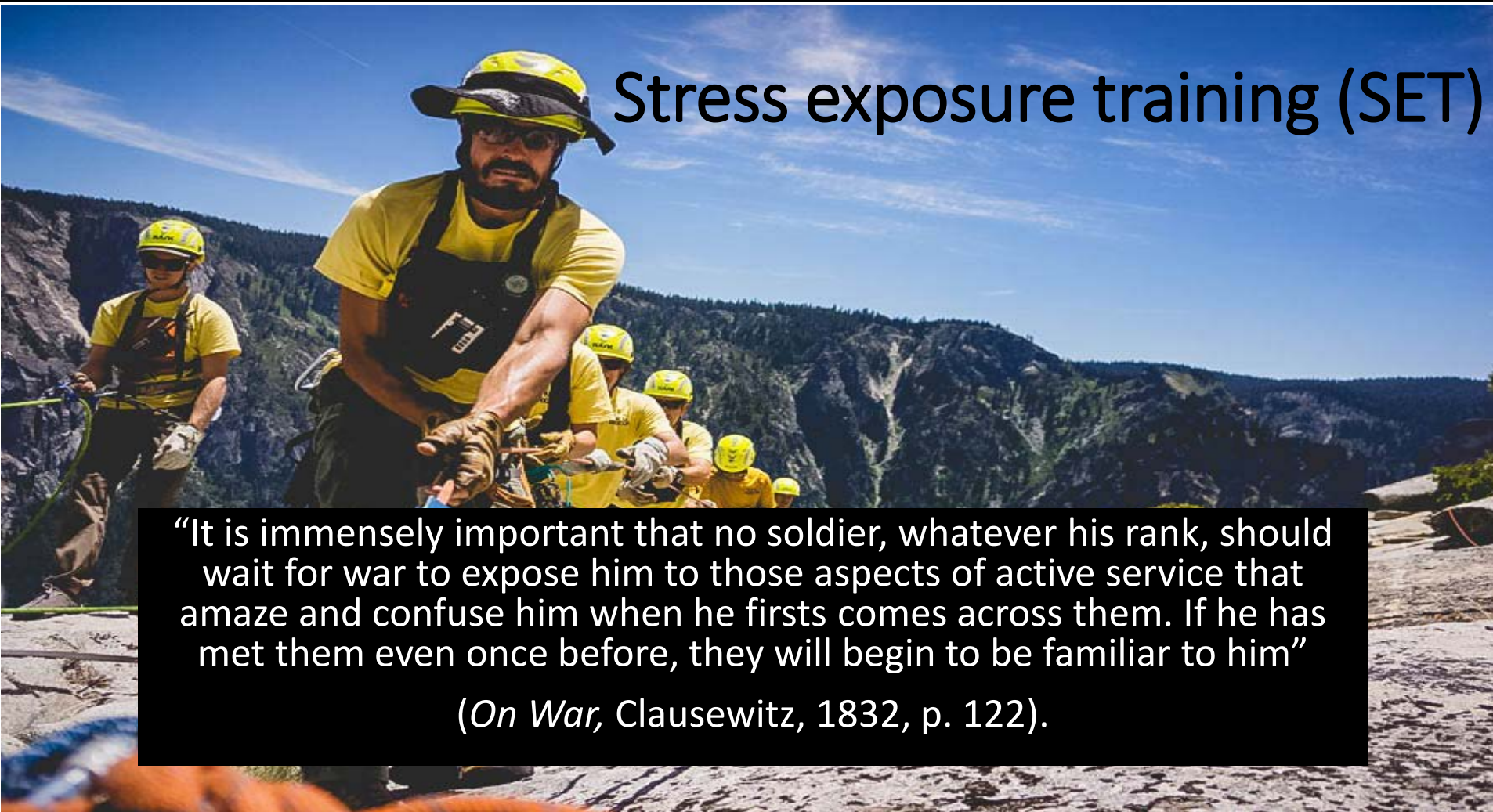
Principles:

- Routine training will be redundant!
- *Crawl-Walk-Run* approach
- Guided error training
- Forced reflection through
AAR's and story telling
- Generativity versus stagnation
- Stress Exposure Training (SET)





Stress exposure training (SET)



“It is immensely important that no soldier, whatever his rank, should wait for war to expose him to those aspects of active service that amaze and confuse him when he firsts comes across them. If he has met them even once before, they will begin to be familiar to him”

(On War, Clausewitz, 1832, p. 122).



Best practice: Training for VUCA environments

Task Stressors

- Time compression
- Ambiguity
- Uncertainty
- High amounts of data
- Workload
- Auditory overload
- Task complexity

Ambient Stressors

- High cost of error
- Adverse physical conditions
- Personal threat
- Interference
- Heat
- Cold
- Isolation

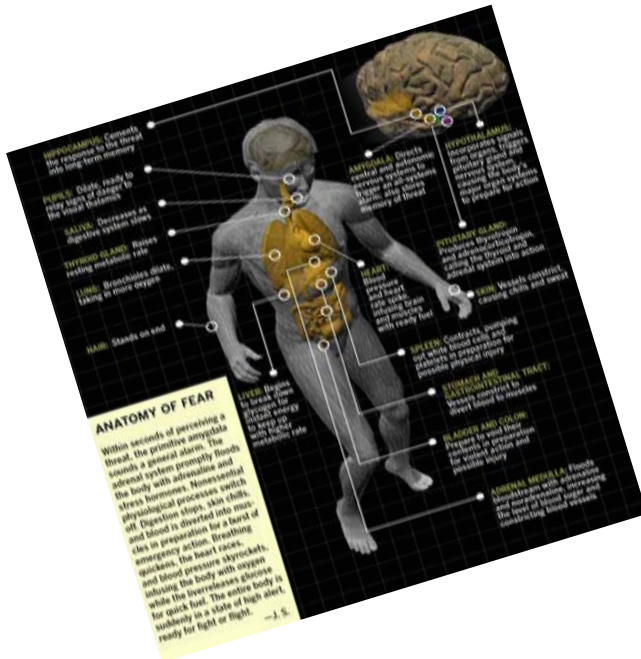




Psychological variables...increasing resilience of SAR personnel



- Threat appraisal awareness
- Cognitive and physiological arousal reduction strategies
- Overlearning
- Mental rehearsal
- Emotional regulation
- Guided error training
- Metacognitive awareness





Preparing personnel to manage injury risks & impacts



Rod Pope





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World

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Comment

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Entertainment

Lifestyle

Travel

Cars

...



NSW News

National

Environment

Health

Education

Good Weekend

Investigations

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SEPTEMBER 25 2016

SAVE

PRINT

SES volunteer in hospital after being injured during flood training

Jodie Stephens



SHARE



TWEET



MORE

An SES volunteer is in a stable condition after he was injured during flood rescue training at Penrith Whitewater Stadium on Sunday afternoon.

Paramedics were called out to the stadium about 2.50pm to reports of a man in medical distress.



NEWS

CQ Rescue winches injured SES volunteer



Troy Kippen | 8th May 2017 7:45 PM



The CQ Rescue helicopter is on its way to Mount Britton.

Jarred Sferruzzi

UPDATE 7:30pm: AN SES volunteer was taken to hospital by RACQ CQ Rescue on Monday after he fell and injured his leg at Mt Britton.

The 29-year-old man was at the time involved in a ground search for another man believed missing for five days in the area.

Due to the extent of the injury and terrain, the volunteer was unable to walk and couldn't be carried by other SES members.

The helicopter and crew left the Mackay base about noon and after offloading excessive weight at the Mt Britton campground carpark, continued on to the man's location.

SES crews in the area used chainsaws to cut trees to enable the paramedic to winch down to the patient where he was able to administer pain relief.

After collecting the injured man, the helicopter collected items left in the campground carpark and arrived at Mackay Base Hospital about 3pm.



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\$757



Importance?

- Personal/family
- Critical team members
- Critical resources
- Mission risks/ success
- Morale
- Long term/ chronic workforce impacts
– less, less capable
- Training impacts
- \$\$?



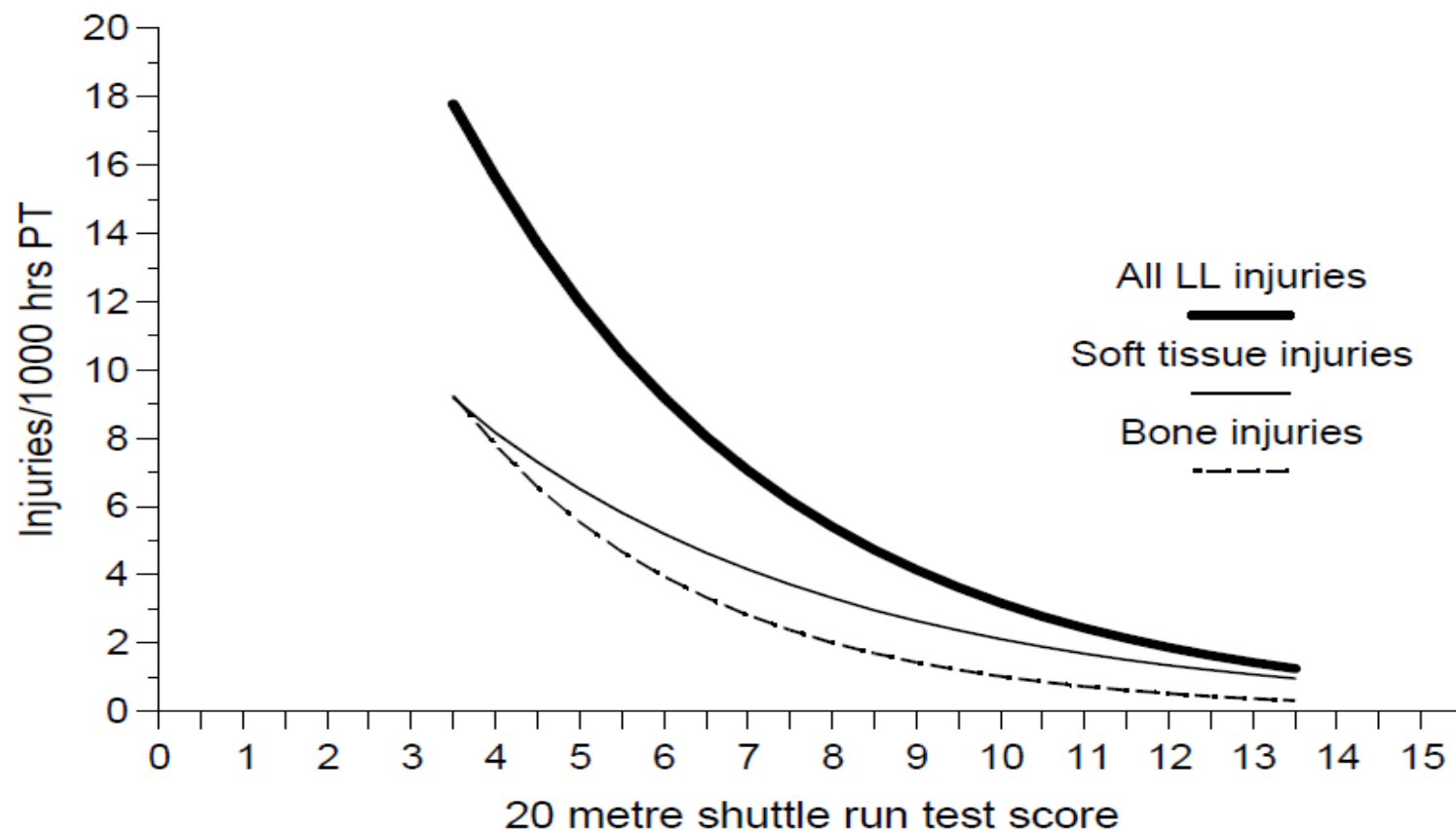


Why? What prep?

- Multifactorial - systems approach
- Some key factors we can manage through preparation:
 - History of prior injury; specificity in rehab/ RTW
 - Aerobic fitness/endurance/strength – 40% rule
 - Level of experience/ skill
 - Psychological status/ preparedness / situational awareness
 - Communication / connectedness / support
 - Loads, equipment (PPE = last defence)
 - Sleep status / fatigue
 - Risk management: external hazards & threats
 - Visibility
- Mechanisms of note:
 - Re-injury: weakened tissues/ unstable joints
 - Fatigue, torque deficiencies
 - Awareness, automation, peripheral narrowing, risk ID
 - Training programs



Photo: Defence Media

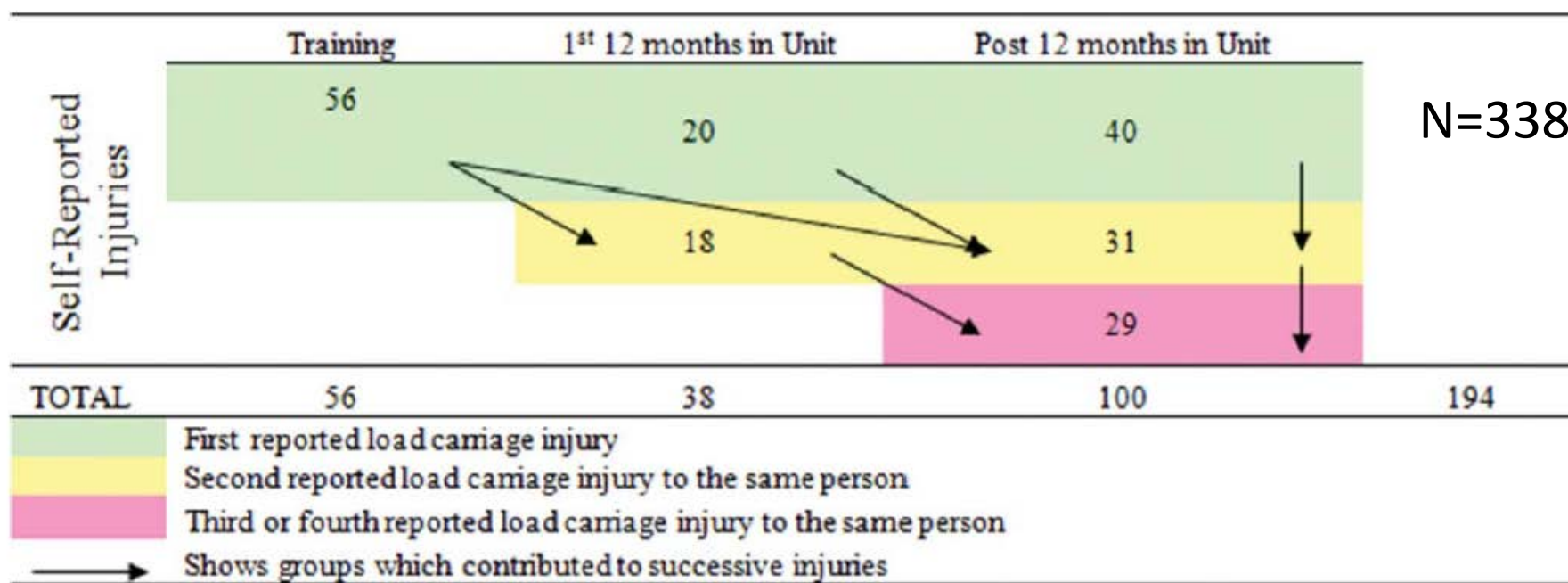


Pope R (2002). Prediction & prevention of injury & attrition in army recruits, pp. 82

www.researchgate.net/publication/273119693_Prediction_and_prevention_of_lower_limb_injuries_and_attrition_in_army_recruits



R.M. Orr et al.



Self-reported injuries by time period.

Robin Marc Orr, Julia Coyle, Venerina Johnston & Rodney Pope (2016). Self reported load carriage injuries of military soldiers. *International Journal of Injury Control and Safety Promotion*, DOI: 10.1080/17457300.2015.1132731



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Preparation of workforce to ensure Security and Protection of Teams

Senior Sergeant

Shane IRVING

Specialist Response Group

Australian Federal Police



Optimal Preparation The 'Why not's'

"Game days are everyday and our opposition don't always play by the rules, our loses will not be counted in points"



Preparation for the task





Holistic Preparation, 'head to toe and everything in between'

- Performance is directly related to preparation, planning and maintenance of capacity therefore capability.....if capability fails, security is compromised
- *'In out and around'* when preparing.....this will counter the *'Why Not's'*
- The 1%er's, they will get you every time
- Load Carriage
- Hydration
- PPE appropriate to match threat/risk vs environment
- Security of an operation, compromise or failure to achieve mission objective can have major Political and Strategic ramifications, particularly in overseas context
- Security of a team can be completely effected in an hour of strenuous activity if one member fails to complete the 1%er's the little things very very quickly can mount to major capability disruption, i.e.



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Head to Toe preparation





Know your resources capability





Preparation, rules to consider when planning for team Optimal Performance

A
E
I
O
U

Mission

Men

Me

Irving 2015

Pete Blaber



Vowel Rule *Irving 2015*

- A Attitude, I can't train that in you!
- E Ego prevents individual learning, inhibits peer growth and team growth and cohesion, we can all learn from being humble, respectful and listening to all around us, all of the time
- I Integrity, linked with Attitude be humble, honest, polite and respectful
- O Ownership, of behaviors, skills, equipment, team performance, own your F@#k ups
- U Understand why you have to do something, understand the strategic intent, find answers, research, aspire and you will inspire



Train the suck tasks, a 1%





Terrain, Topography, Temperature





Summary and Take Away

- Preparation from head to toe, 'IN, OUT and AROUND
- Performance is directly related to preparation, planning and maintenance of capacity therefore capability.....if capability fails, security is compromised
- Instill culture of 3M's
- The 1%er's can make the difference between mission compromise or success
- VOWEL rule of preparation, command and execution of mission
- As a leader understand our people, understand where your operators sit in this spectrum, know their traits, their triggers and their strengths, as a leader you can adjust and maneuver to get the most out of your capability
- All essential for Optimal Performance and Security in Harsh and Volatile environments
- All the above will stop the.....'Why Not's' being asked



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Search and Rescue in Hot and Humid Conditions

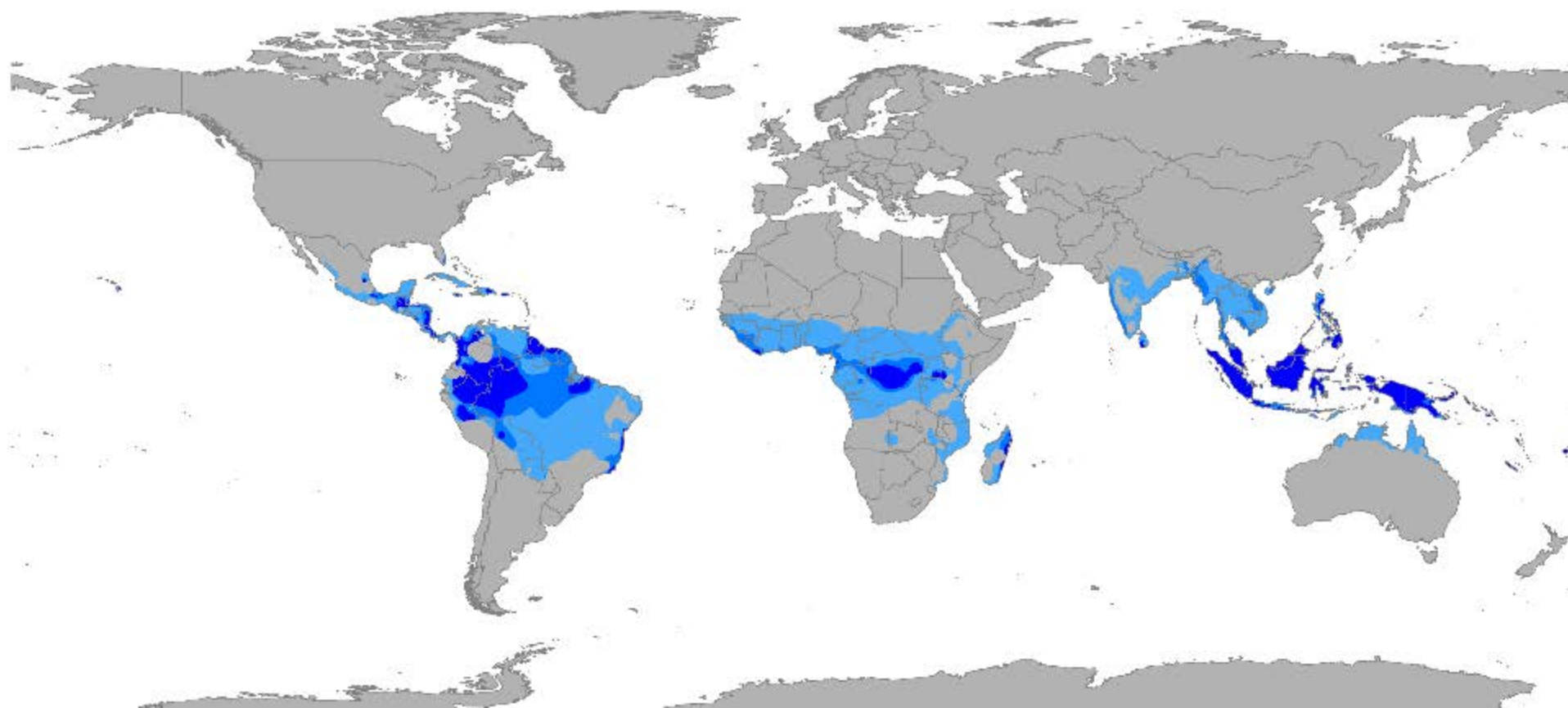
Matt Brearley PhD



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Tropical Climates





Earthquake Hazard Distribution





Search and Rescue in the Heat

- Resource limited setting
- Restricted access to cooling techniques
- Maximise heat tolerance prior to deployment
- 24h USAR simulation to assess HA v NHA



Participants

Variable	Heat Acclimatised	Non Heat Acclimatised
n	8	8
Age (yrs)	37.9	41.3
Body Mass (kg)	86.2	98.1
Height (m)	1.79	1.83
Body Mass Index	26.9	29.2



Physiological Monitoring





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Disaster Scene





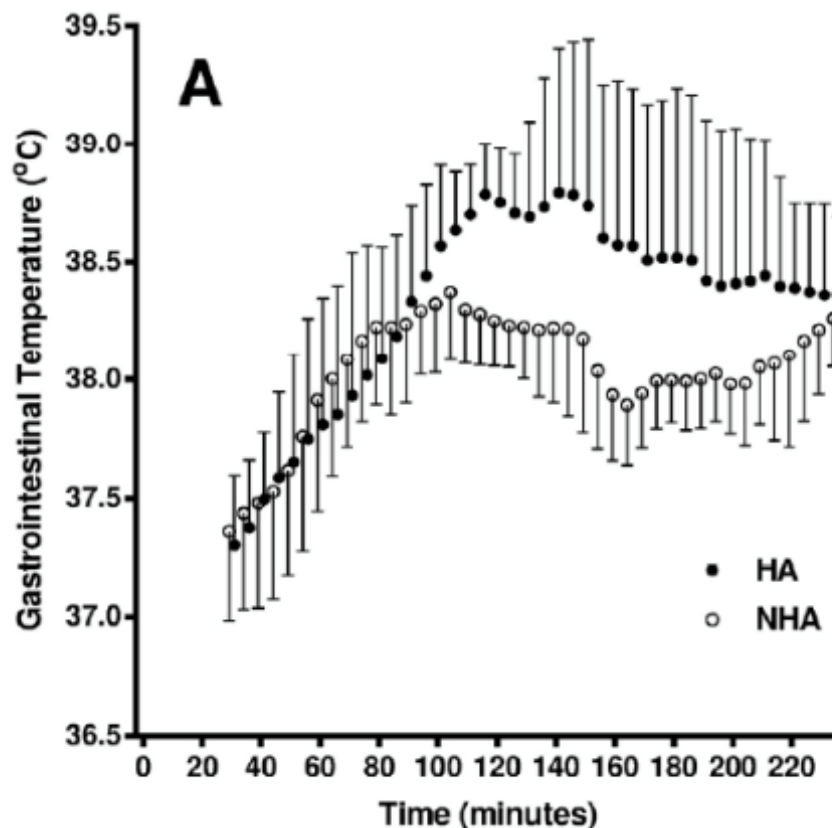
Study Overview

- 16 NTFRS and QFES participants
- Disaster Scene on outskirts of Darwin, NT
- Commenced ~1300
- All 16 participants worked initial 4 hour shift
- 34.0°C, 48% RH, 31.4°C WBGT, Full Sun
- Thereafter rotating to complete ~15/24 hours
- Overall 29.4°C, 72% RH



Findings

- Similar CT ~90mins
- HA ↑ CT
- Similar perception between HA and NHA
- Similar hydration between HA and NHA
- 'Heat Hangover'



Brearley M, Norton I, Rush D, Hutton M, Smith S, Ward L, Fuentes H (2016). Influence of Chronic Heat Acclimatization on Occupational Thermal Strain in Tropical Field Conditions. J Occup Environ Med. 58(12): 1250-1256.



Heat Hangover





Hours	CT / HR	N	H	V	Prev. 2h T _{gi} /HR
9.5*	37.3 / 104	■	■		37.5 / 114
9.5	37.8 / 131	■	■		37.3 / 113
9.6*	38.2 / 101	■	■		38.0 / 121
13.5	37.2 / 96	■	■	■	Sleeping
18.0	37.4 / 117	■	■		37.3 / 96
20.7	38.2 / 132	■	■		37.4 / 130
21.3	37.4 / 125	■	■		37.3 / 113



Recommendations

- Annual heat awareness and management training
- Year round physical training to maintain HA
- Guidelines to develop HA for NHA personnel with sufficient notice of impending deployment



Heat Acclimatisation Guidelines

-
-
-
-
-

Rating	Descriptor
0	Nothing at All
0.5	Very, Very Light
1	Very Light
2	Fairly Light
3	Moderate
4	Somewhat Hard
5	Hard
6	
7	Very Hard
8	
9	
10	Very, Very Hard

Days	Score	Example Sessions
1-2	80-120	40 minutes of brisk walking (3/moderate)
3-4	120-180	50 minutes of brisk walking (3/moderate)
5-6	180-220	70 minutes of brisk walking (3/moderate)
7	-	Recovery day to assist adaptation
8-10	220-250	80 minutes of brisk walking (3/moderate)
10-14	250 +	90 minutes of brisk walking (3/moderate)

Brearley M (2016). Pre-deployment Heat Acclimatization Guidelines for Disaster Responders. Prehosp Disaster Med. 31(1):85-9.



Take Home Message

- Year round physical training to induce/maintain heat acclimatisation
- Annual heat awareness and management training
- Maximise heat tolerance prior to deployment
- **Deploy HA responders**

Brearley MB, Norton IN, Trewin AS (2017). The Case for Heat Acclimatization of Disaster Responders - An Australian Perspective. Front. Public Health 5:98.



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Preparing and maintaining for field operations - Fire

Bond University Health Sciences – TRU
&
QFES
Inspector Richard Gorey



Who Am I?

- 28 years Emergency Service – 25 with QFES.
- 25 Years diver with DT8 RANR
- 12 years in Technical Rescue as a level 2 operator and Project Officer
- QFES AusRep & undergoing Cat 3 USAR training
- Manager Regional Wellness – Brisbane Region
- Technical advisor & Masters student- Bond Uni



The Foundation

- Appropriate pre-selection both physical and psychological
- Use only validated physical entry standards appropriate to the skill sets
- Psychological testing for temperament and resilience
- Pre-screening and medical assessment prior to commencement of testing as a baseline and a guide for improvement or to reduce injury risk.
- Non-biased
- Provide guidance on preparation, maintenance and rehabilitation.



Known, Anticipated and the Stretch

- Understand the extremes of your operational theatres and core business and train for these.
- Outside of this, what could be anticipated?
- What capacity do the individuals and the organisation have for surge or stretch capacity?
- Capture lessons learnt from training and operations to feedback, adjust and improve.
- Reward, re-evaluate, support, build pride.



Case Study – Samoa 2009

- 2 Hours warning to deploy
- Small group – nowhere to hide – heavy loads
- High heat, full sun, heavy PPC, rough terrain
- Limited facilities for recovery and unwind
- Operating from closed compound near impact zone



Case Study - Christchurch

- 6 hours notice to deploy
- Large group – cramped conditions
- Variable climate
- Large number of deceased victims
- High risk worksite – stability
- Living in the work zone





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Case Study - Christchurch





Case Study - Grantham

- Unanticipated scenario
- No Helo Training – default to known trained skills
- Insufficient “recognition primed decision making” in this field
- Some skills were directly transferrable
- Rescue skills must be developed to be performed subconsciously



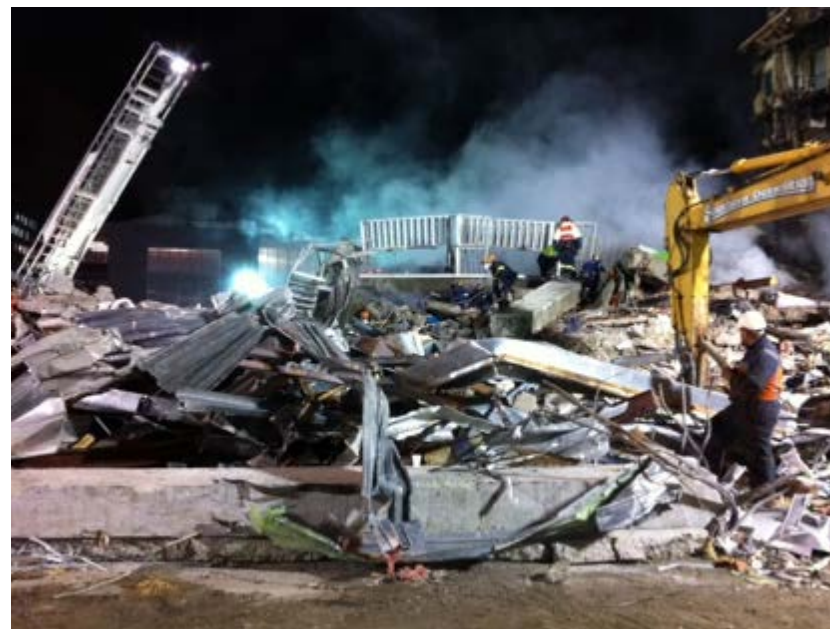
Critical Physical Platforms

- Joint mobility and stability
- Core functionality
- Strength and strength endurance
- Sound understanding of the principles and concepts of safe lifting and control of load external to the body
- Resilience in the 3 key areas of injury
- Ability to operate in temperature extremes and under load.



Critical Mental Platforms

- Team player
- Resilient
- Ability to 'let go' and 'step away'
- Strong stress coping mechanisms
- A 'long fuse' and good sense of humour
- Self confident
- Strong empathy understanding





Critical Training Platforms

- Equipment operation and skills must be trained to the automatic response level.
- Train the decision making process under pressure, not the ability to follow a template.
- Spend some time training the way you play.
- Variety – minimise predictability.
- Support physical training



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LOAD CARRIAGE IN SAR

Dr Rob Orr



CASE STUDY

- Person missing while hiking in the Blue Mountains
- Searching for 8 hours in cold weather and rain – storm front approaching
- Due to weather – stretcher carry exfil/recovery



<http://www.grough.co.uk/lib/img/editorial/KirkbystephenCautley-Spout-2.jpg>





CASE STUDY

- How prepared are you for a load carriage task that:
 - Includes steep and arduous terrain?
 - Must be completed as quickly as possible?
 - Has heavy loads on the back AND in the hands?



<http://www.grough.co.uk/lib/img/editorial/KirkbystephenCautley-Spout-2.jpg>



LOADS CARRIED

- Conolly et al., 2015:
 - Prolonged hiking with loaded backpack (13.5-23 kg), helmet, and harness in mountainous terrain with shared litter loads that can be in excess of 45 kg





RISK ENHANCING FACTORS

- ↑ in speed of load carriage = ↑ in the energy cost of carrying given load (more than weight)?
↑ 0.5km/h = ↑ 10kg



http://mountainenterprise.com/fds/images/story/fs_4764.jpg



RISK ENHANCING FACTORS

- \uparrow in gradient of load carriage = \uparrow in the energy cost of carrying given load (more than weight)?
 $\uparrow 1\% = \uparrow 10kg$



<https://www.stgeorgeutah.com/wp-content/uploads/2012/03/wsr-1a.jpg>



RISK ENHANCING FACTORS

- Different terrains types will elicit different energy cost requirements
(road-light brush-heavy brush-sand)



<http://nebula.wsimg.com/cbb11ca9ccde7d368b56c5b7339d688c?AccessKeyId=FE8612ED32EE26907E09&disposition=0&alloworigin=1>



<http://crowboroughlife.com/wp-content/uploads/2015/02/Search-and-Rescue.jpg>



<http://d1udmfvw0p7cd2.cloudfront.net/wp-content/uploads/2014/10/n-searchresume-b-20141002-870x575.jpg>



RISK ENHANCING FACTORS

- Differences in load placement will elicit differences in energy cost.
 - Weight on the feet more costly than the back
 - Thigh more costly than back (0.5kg ↑ cost by 3.5%)
 - Shoulder more costly than back
 - Hands around 2 x more costly than back*
 - Sustainment time is significantly shorter with hand carried loads
 - Unilateral load causes gait asymmetries and again ↑ energy costs



<http://woodheadmrt.org/wp-content/uploads/2015/09/woodheadmrt1200.jpg>



LOAD CARRIAGE CONDITIONING

Research by Orr et al. (2010) and Knapik et al., (2012) recommend:

- F.I.T.T Formula (Frequency, Intensity, Time & Type)
 - F. 7-10 days per load carriage session
 - I. To loads required at the speeds and over the terrains required
 - T. Duration of load carriage operations
 - T. Load carriage preferable, but combined resistance and cardio may be of some benefit



CASE STUDY

- How prepared are you for your next SAR task?
- Have you undertaken sufficient load carriage conditioning to prevent yourself from becoming an acute casualty or suffering longer term/chronic pathologies?



<http://www.grough.co.uk/lib/img/editorial/KirkbystephenCautley-Spout-2.jpg>



TAKE HOME MESSAGES

- Load carriage is about more than the load weight, terrain type and grade, speed of movement and load position must be taken into account
- To minimise the risk of injury and increase the potential for operational success SAR personnel need to be conditioning to carry load **IN THEIR RELEVANT CONTEXT**



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Wrap-Up & Panel Discussion